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National Disparities and Standards-Essential Patents: Considerations for India

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COMPLICATIONS AND QUANDARIES IN THE ICT SECTOR: STANDARD ESSENTIAL PATENTS AND COMPETITION ISSUES (Ashish Bharadwaj, Vishwas Deviah & Indraneth Gupta, eds., Springer, 2017 forthcoming)

NATIONAL DISPARITIES AND STANDARDS-ESSENTIAL PATENTS: CONSIDERATIONS FOR INDIA[1]

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Today's technology product markets, particularly in the information and communications technology (ICT) sector, are broadly international. Products designed in California may be assembled in China from parts sourced in Germany for sale to consumers in India. The global character of technology markets underscores the importance of technical interoperability standards which include protocols and technologies such as Wi-Fi and Bluetooth (wireless networking), 4G LTE (wireless telecommunications), DVD and Blu-Ray (digital media storage) and MP3/MP4 (digital content encoding). These standards enable products and components manufactured by vendors around the world to operate together without customization or firm-to-firm interaction. Recent studies have shown that standards contribute strongly to economic growth and development (Ernst et al. 2014).

Patents covering technical standards have also taken on increasing importance in global trade, business negotiations and relationships among firms. This chapter considers the impact of patents on international technical standardization and the production of standards-compliant products. In particular, it assesses the impact that "standards-essential" patents (SEPs) have had on individual firm behavior and intra-firm dynamics. It also evaluates available options to reduce disparities between those firms, primarily from large developed economies, that hold significant portfolios of SEPs, and those firms, primarily from the developing world, that do not.[2]

I. *Standards and the International Standard-Setting Landscape*

While many health, safety and environmental standards are developed by governmental agencies, the vast majority of technical interoperability standards originate in the private sector (Ernst 2012, Biddle et al. 2012). In the U.S., there is an express governmental preference for privately-developed standards over government-developed standards,[3] and elsewhere this preference has generally been supported by the market.

[1] Earlier versions of this chapter have benefitted from presentation and discussion at the Workshop on Mega-Regionalism: New Challenges for Trade and Innovation (MCTI) (Honolulu, January 20-21, 2016), the Conference on Innovation, Intellectual Property, Competition and Standard-Setting in the ICT Sector sponsored by Jindal Global University (New Delhi, August 20-21, 2016), and from helpful comments and discussion with Ashish Bharadwaj, Dieter Ernst and Brian Kahin.

[2] The World Trade Organization (WTO) Agreement on Technical Barriers to Trade pmbl., Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1A, 1868 U.N.T.S. 117 (TBT Agreement) is designed to "ensure that technical regulations and standards … do not create unnecessary obstacles to international trade." *See generally* Bremer (2016). In general, such requirements pertain to the use of nationally-mandated health and safety standards to prevent free trade in products. This body of law, which has prompted a significant academic literature, addresses a different set of concerns than the current chapter, which focuses on the ways in which voluntary technical standards and associated patents may advantage or disadvantage firms from different countries.

[3] Office of Management and Budget (OMB) Circular A-119 (1998). See Bremer (2016).

Some widely adopted interoperability standards (e.g., Microsoft's .doc and Adobe's PDF electronic document formats) are single-firm proprietary formats (*de facto* standards). Over the past two decades, however, most successful interoperability standards have been developed by groups of firms that collaborate within voluntary associations known as standards-development organizations or standards-setting organizations (SSOs). The resulting standards are often referred to as "voluntary consensus standards", which will be the principal focus of this chapter.

SSOs vary greatly in size and composition. The European Commission (EC 2014) identifies three broad categories of SSO:

> (1) those that are formally recognized by governmental bodies. These include:
>
> > *international* groups (e.g., the International Organisiation for Standardisation (ISO) and the International Telecommunications Union (ITU)),
> >
> > *regional* groups (e.g., the European Telecommunications Standards Institute (ETSI)), and
> >
> > *national* groups (e.g., Germany's Deutsches Institut für Normung (DIN), the Japanese Standards Association (JSA), China's National Institute for Standardization (CNIS) and the Bureau of Indian Standards (BIS)).[4]
>
> (2) "quasi-formal" groups that are typically large international organizations that share many of the characteristics of formally recognized groups (e.g., the IEEE Standards Association, ASTM International and the Internet Engineering Task Force (IETF)), and
>
> (3) smaller, privately-organized consortia (also known as special interest groups or fora), including groups such as the Bluetooth SIG, HDMI Forum, USB Forum and hundreds of others.[5]

Table 1 below lists a number of widely-adopted ICT standards and the organizations in which they were developed.

Table 1
Selected ICT Standards and Where they were Developed

Standard	Description	SSO	EC Class
802.11	Wireless networking	IEEE	2
Bluetooth	Short-range wireless networking	Bluetooth SIG	3
CD	Compact disc (digital media)	n/a[6]	n/a

[4] The American National Standards Institute (ANSI) presents a somewhat unusual case, inasmuch as it is a private organization which is recognized in certain capacities by the U.S. government. ANSI oversees, accredits and establishes policy for national SSOs that wish to develop American National Standards. Among other things, ANSI-accredited SSOs must adopt due process and intellectual property policies that comply with ANSI's "Essential Requirements".

[5] Updegrove (2015) catalogs more than 1,000 such groups.

Standard	Description	SSO	EC Class
CDMAone/IS-95	2G wireless telecommunications	Qualcomm/ TIA[7]	n/a 2
DVB	Digital video broadcast (Europe)	DVB Forum	1
DVD	Digital media	n/a[8]	n/a
Ethernet	Device networking	IEEE	2
GPS	Global Positioning System	n/a[9]	n/a
GSM	2G wireless telecommunications	ETSI	1
H.264	Audiovideo encoding	ITU	1
HDMI	High-definition multimedia interface	HDMI Forum	3
HDTV	High-definition broadcast tv (US)	ATSC	3
HTTP	Hypertext transfer protocol	W3C	2
IP	Internet protocol	IETF	2
LTE	4G wireless telecommunications	ETSI	1
MP3/MP4	Audio and video compression	MPEG (ISO/IEC)	1/2
PDF	Portable Document Format	n/a[10]	n/a
SDRAM	Semiconductor memory	JEDEC	2
UMTS	3G wireless telecommunications	ETSI/3GPP	1
USB	Device networking	USB Forum	3
V.90	56k modem	ITU	1
VHS	Video cassette media	n/a[11]	n/a
WWW	Worldwide web	W3C	2
XML	Extensible markup language	W3C	2

II. *Firm-Level Participation in Standard-Setting*

Firm-level participation in SSOs varies according to the type and nature of the SSO. ISO, probably the most prominent Category 1 SSO, allows participation solely on a national basis, so that each member state has a delegation that represents its interests at the SSO. Criteria for participation in a national delegation are determined at the national level. The U.S. representative to ISO, for example, is ANSI. Other Category 1 SSOs may limit participation to firms and institutions engaged in business in a particular geographic area. For example, the members of the European Committee for Electrotechnical Standardization (CENELEC) comprise the national electrical standardization committees of each European state. Some Category 1 SSOs, such as ETSI, open membership to all interested parties, but offer different membership categories and benefits to those within the region of focus (Europe, in the case of ETSI).

In contrast, Category 2 SSOs are generally open to all interested parties on an equal basis. Participation depends on firms' interest in the relevant area of standardization, as

[6] The CD specification was developed primarily by Philips and Sony.
[7] CDMA technology was initially developed by Qualcomm, which then submitted it for adoption to the Telecommunications Industry Association (TIA).
[8] The DVD specification was developed primarily by Philips, Sony, Toshiba and Panasonic.
[9] The GPS standard was originally developed by the U.S. Department of Defense.
[10] PDF is a proprietary format developed by Adobe.
[11] The VHS format was developed by Matsushita/JVC.

well as its ability to bear the not insignificant personnel, travel and technology costs associated with SSO participation. It is no surprise that large global technology firms participate in fifty or more different SSOs, with the largest involved in more than one hundred SSOs each (Baron & Spulber 2015). Participation in large, international SSOs in the ICT sector has traditionally been international in character, with representation from firms and institutions based in North America, Europe, Oceana, Japan, Korea and India. Over the last decade, Chinese firms have dramatically increased their participation in international SSOs, in some sectors surpassing participation from all countries other than the U.S. (Ernst 2011, Contreras 2014). Despite recent gains by China, SSO participation by firms in less-developed countries, particularly in Latin America and Africa, has remained at low levels.

Category 3 SSOs or consortia are usually formed by small groups of firms interested in developing a specific technology or standard. Often these "founder" or "sponsor" firms hold patents relevant to the technology in question (Biddle et al. 2012). Such founders are typically large multinational firms with substantial patent portfolios, but may also include smaller, specialized firms focusing on the target technology area and large industry participants that manufacture products or systems that will be dependent on the standard, but which do not themselves hold large technology or patent portfolios (e.g., an electrical power utility that may be dependent on new smart grid communications technologies, but which does not itself develop such technologies).

III. *Patents and Standards*

A. *Patenting Standards*.

As noted above, standards are sets of protocols and technical descriptions of product features that enable product interoperability. While standards themselves are not patentable, products that are compliant with the technical requirements of standards (often referred to as standards-compliant products) generally satisfy the statutory requirements for patent protection. The owners of patents covering these standardized technologies (referred to as standard-essential patents or "SEPs") are often the firms and institutions that employ individuals who make particular inventive contributions to standards. Some of these contributions may be made jointly and owned by multiple firms, but in most cases firms individually submit technical contributions to the standard-setting process and own the resulting SEPs.

Because standards documents are often quite lengthy and complex, sometimes running to hundreds or thousands of pages, multiple inventive concepts are frequently embodied in the same standard, leading to the possibility of multiple patents covering any given standard. For example, Blind et al. (2011) report large numbers of patent families[12] declared to be essential to various standards including WCDMA (1000 patent families), 4G LTE (1000 patent families), MPEG-2 and MPEG-4 (160 patent families), optical disc drive standards (2200 patent families), and DVB-H (30 patent families)).

Ordinarily, if the vendor of a product that infringes a patent is unable, or does not wish, to obtain a license on the terms offered by the patent holder, that vendor has three

[12] A patent "family" consists of all individual patents deriving from a single, initial patent application. These may include individual patents in multiple countries, as well as multiple patents in the same country derived from the same initial application (e.g., continuation, continuation-in-part and divisional applications in the U.S.).

choices: to stop selling the infringing product, to design around the patent, or do neither and risk liability as an infringer. With standards-compliant products, however, designing around the patent may be impossible or economically infeasible. Moreover, once a standard is approved and released by an SSO, market participants may make significant investments in plant, equipment and labor, based on anticipated implementation of the standard in products (a situation often referred to as lock-in) (Shapiro & Varian, 2001). In such cases, the cost of switching from the standardized technology to an alternative technology may be prohibitive, thereby increasing the patent holder's leverage in any ensuing negotiation over licensing rates. This phenomenon has been termed patent "hold-up" and is discussed extensively in the literature ((Lemley & Shapiro 2007, Contreras 2016).

As noted above, complex technological products may implement dozens, if not hundreds, of standards each of which may be covered by hundreds or thousands of patents. As such, the aggregation of royalty demands by multiple patent holders could lead to cost-prohibitive burdens on implementing standards-compliant products. This situation is sometimes referred to as "royalty stacking" (Lemley & Shapiro 2007, Contreras 2016).

B. SSO Patent Policies

Over the past two decades, SSOs have responded to the increasing number of patents covering standardized technologies and the perceived threats of patent hold-up and stacking by adopting a series of policy measures intended to address these concerns. SSO patent policies today fall into two general categories: disclosure policies and licensing policies, and often include elements of both. Disclosure policies typically require participants in the standards development process to disclose SEPs that they hold. Licensing policies typically require that participants grant manufacturers of standardized products licenses under their SEPs on terms that are "fair, reasonable and nondiscriminatory" (FRAND) or royalty-free (RF).

These commitments purport to assure manufacturers that they will be able to obtain licenses (which may sometimes involve a payment) to sell standards-compliant products covered by SEPs. Perhaps, in part, because FRAND commitments require relatively little administrative overhead to enact, their use has become widespread among SSOs.[13] Nevertheless, a consistent, practical, and readily enforceable definition of FRAND has proven difficult to achieve. No SSO defines precisely what FRAND means, and many affirmatively disclaim any role in establishing, reviewing, or assessing the reasonableness of FRAND licensing terms. This lack of certainty has contributed to recent litigation over FRAND commitments (Contreras 2013), and leaves most of the details of licensing arrangements to bilateral negotiations among patent holders and potential licensees.

IV. Impact of Patents on International Participation in Standard-Setting

A. Patenting by SSO Participants

Over the past two decades there has been a sharp increase in patenting within certain technology standardization sectors, particularly wireless telecommunications (Bekkers & West 2009). In addition, a core group of firms in the telecommunications sector

[13] FRAND commitments (or similar commitments to license patents on a royalty-free basis) are required of all SDOs accredited by ANSI.

accounts for the large majority of patent filings covering ICT standards. These firms include Qualcomm, InterDigital, LG Electronics, Nokia, Samsung, Ericsson and Motorola (Blind et al. 2011, Baron & Pohlmann 2015). In addition, Contreras (2014) observes a rapid increase in patenting activity by Huawei in the area of Internet standardization. These statistics suggest that patenting behavior is not concentrated among firms of any one country, but is distributed at least among firms based in the major developed economies (U.S. (Qualcomm, InterDigital and Motorola), Korea (LG and Samsung), Europe (Nokia and Ericsson), and China (Huawei)).[14]

When considering levels of patent acquisition, it is important to note that a firm's home jurisdiction is relatively immaterial to the jurisdictions in which it seeks and obtains patents. That is, a large firm with a global market is likely to seek patents in all major markets, no matter where it is based. Thus, in 2014, the ten firms to which the greatest number of U.S. patents were awarded were: IBM (US), Samsung (Korea), Canon (Japan), Sony (Japan), Microsoft (US), Toshiba (Japan), Qualcomm (US), Google (US), LG (Korea) and Panasonic (Japan) (USPTO 2015). It is likely that a comparable distribution exists in most other jurisdictions, with at most a modest "head start" advantage for local firms. Thus, in India, research conducted by the author and the Centre for Internet and Society has found that nearly 100% of Indian patents covering mobile device technologies are owned by foreign companies (Contreras & Lakshané 2016). These are, by and large, the same major international technology firms that are active throughout the world.

These findings suggest that in terms of standard-essential patents (and, most likely, all patents), firms can be classified as either "Haves" or "Have-nots". The Haves are generally large multinational technology-focused firms based in North America, Europe and the Asia Pacific economies.[15] The "Have-Nots" are all others.[16] It is important to note that not all firms based in these key jurisdictions are Haves. Smaller firms and new market entrants in developed economies are also likely to be Have-Nots. Likewise, not all firms based in developing economies are, or must remain, Have-Nots. A prominent example is China-based Huawei which, in the span of just a few years, rose from insignificance to dominace in the area of Internet standardization and related patent holdings (Contreras 2014). Other large firms in China, India, Brazil and other emerging economies may also be situated to invest the resources necessary to increase their patent portfolios in this manner. However, it appears that most firms in these jurisdictions are likely to be classified as Have-Nots.

B. Patent Licensing Dynamics

As noted above, most SSOs require that their participants license standards-essential patents to product manufacturers on terms that are either FRAND or royalty-free (RF). Thus, at least as to standardized technologies, patent acquisition and enforcement is unlikely to result in outright exclusion of competitors from a market. However, in markets

[14] Though Japanese firms such as Sony, Toshiba, Sharp and Panasonic have played major roles in many areas of ICT standardization, particularly consumer electronics and digital media, they are comparatively underrepresented in telecommunications and networking SSOs, due largely to early policies adopted by the Japanese government (Contreras 2014).

[15] As Ernst et al (2014) observe, "As technologies become more complex and inter-related, advanced countries have pre-empted fundamental technologies by aggressive patenting" (p. 856).

[16] For more comprehensive discussions of patent disparities among firms in developing versus developed economies, see Ragavan (2016, Ch. 2) and Maskus (2012).

characterized by FRAND (as opposed to RF) licensing, transactions are not always smooth or equitable, particularly in relation to transactions between Have and Have-Not firms.

The situation often plays out as follows: a standard is developed at an international SSO. Firms that participate in the SSO obtain patents covering the standard throughout the world. The standard then becomes implemented in products that are sold globally. By the time that firms in less-developed countries become aware of the potential for sales of such products in their own countries (possibly with locally-attractive features, lower costs or domestically-sourced components), the basic product technologies have already been patented by foreign Have firms. Local Have-Nots must thus seek licenses from foreign Haves in order to manufacture standardized products for their domestic markets. As observed by Ernst et al. (2014), such firms (which they term "latecomers") "are naturally disadvantaged in the world of international standards as they have not contributed to the 'core technology' on which these standards are based ... Latecomer firms are thus forced to accept standards and pay royalties as decided by the dominant economic players." (p. 854).

The royalties sought by foreign patent-holding firms, while arguably reasonable on an international basis, may be viewed as excessive in local markets. The royalty burden owed to foreign firms can thus be viewed as inequitable by local firms and governments, particularly if foreign Have firms enter the market and compete with or displace local Have-Not firms (Ernst 2015).[17] The perception of unfairness can be exacerbated when foreign firms actively enforce their patents against local market participants in their domestic markets. This situation has recently occurred in India where, over the past three years, multinational telecommunications vendor Ericsson has brought patent infringement suits against several Indian and Chinese handset vendors serving the domestic Indian market (DIPP 2016, Contreras & Lakshané 2016, Ernst 2015).

V. *Potential Responses*

As noted above, participating in international standards development and patenting can have beneficial local effects and can help Have-Not firms to advance their development and growth. Likewise, the aggregation of patents by Have firms in developing countries can have significantly negative effects on local firms and innovation (Ernst et al 2014, 861) Accordingly, a range of responses, both public and private, have been proposed to the perceived disparity in SEP holdings between foreign Have firms and domestic Have-Not firms in less-developed countries. In many cases, these responses are not mutually exclusive and may co-exist within a country or region. The principal responses are considered below:

A. Embrace the Status Quo

Action is required to address a situation only if a problem exists. There are many who would argue that the current patent imbalance between Have and Have-Not firms is a natural result of market-based global trading. The situation is no different than it is in many other industries including pharmaceuticals, automotive and aviation, in which a handful of

[17] In addition, the royalty burden on local Have-Not firms is often greater than the burden on other foreign Have firms that hold patents that may be used as bargaining chips in cross-licenses with other Have firms. The result is that Have firms that have entered into cross-licensing networks generally have a low monetary royalty burden as compared to Have-Not firms that lack patents essential to relevant standards.

firms from developed countries dominate the market. In such a market, all firms have the potential to succeed based on superior innovation and technical skill.

This is potential is particularly salient in the area of technical standardization, in which SSO participation is, in many cases, open to all interested organizations irrespective of national origin. The success of firms from small countries (e.g., Philips (Netherlands), Nokia (Finland) and Ericsson (Sweden)), and from developing economies (e.g., Huawei and ZTE (China)) demonstrates that the "club" of successful market entrants is not limited to firms from the largest developed economies. Thus, special measures designed to create a greater balance between the interests of Haves and Have-Nots could be counterproductive.

B. Go-It-Alone Standardization

In the early 2000s, the Chinese government began to realize that western firms had dominated the wireless telecommunications standards field, and Chinese firms balked at the high royalty rates charged by these firms (Ernst, 2011; Vialle et al. 2012). In response, the Chinese government embarked on a "go-it-alone" approach to 3G standardization, seeking to "catch up" to western firms by producing a workable 3G technology that would be patented by Chinese firms (Ernst 2011). The result was TD-SCDMA, a Chinese standard[18] that was developed by the Chinese Academy of Telecommunications Research (CATT) and its state-owned affiliate Datang in collaboration with German equipment vendor Siemens. Though TD-SCDMA is not generally viewed as a technological or market success, the TD-SCDMA experience appears to have advanced China's goal of building domestic technical expertise, patent leverage and manufacturing capacity for advanced telecommunications products (Vialle et al. 2012). The cost of China's indigenous standardization program, however, has been high. China is reported to have developed more standards than any other country (Ernst 2011), yet few of these standards are in use outside of China. Today, China has turned increasingly toward international interoperability standards, with Chinese firms playing significant roles in international SSOs (Contreras 2014) (see Part E, below).

C. Protectionist Legal Measures

When a government perceives that its domestic producers are being disadvantaged by foreign interests, a natural reaction is to implement regulations, and undertake enforcement actions, intended to protect the local industry. Of course, expressly protectionist regulation in the area of intellectual property generally flies in the face of widely-adopted international treaty obligations such as the WTO Agreement on Trade-Related Aspects of Intellectual Property Rights (the TRIPS Agreement),[19] as well as more recent bilateral and multilateral trade agreements such as the Trans-Pacific Partnership (TPP).[20] Nevertheless, protectionist measures that impede the activity of foreign patent holders may be disguised as prohibitions of unfair business practices and anticompetitive behavior, and may remain on the books for years before they are successfully challenged.[21]

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[18] China also submitted TD-SCDMA to the International Telecommunications Union (ITU) for recognition as an international standard, and the ITU approved TD-SCDMA in 2000.

[19] World Trade Organization, Agreement on Trade-Related Aspects of Intellectual Property Rights, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, 15 April 1994, in World Trade Organization, The Legal Texts: The Results of The Uruguay Round of Multilateral Trade Negotiations 321 (1999), *available at* http://www.wto.org/english/docs_e/legal_e/27-trips.pdf.

[20] Trans-Pacific Partnership (TPP), Chapter 8 (Technical Barriers to Trade).

[21] For example, Ernst et al (2014) argue that "constraining strategic patenting by owners of essential patents that

Another protectionist approach is the targeted enforcement of existing regulations against foreign entities. There has been a spate of recent competition law investigations and enforcement actions against large Western holders of standards-essential patents in China, Korea and India.[22] For example, in February 2015, China's National Development and Reform Commission ("NDRC") fined Qualcomm approximately US$975 million for a host of alleged violations of China's Antimonopoly Law in connection with its licensing of standards-essential patents. The Korean Fair Trade Commission is also reported to be investigating Qualcomm. And in India, the Competition Commission of India (CCI) has investigated Ericsson in connection with Ericsson's patent infringement suits against Indian and Chinese manufacturers of mobile phones for the domestic Indian market (DIPP 2016, Contreras & Lakshané 2016).

A final way that governments can seek to reduce the dominance of foreign patent holders in domestic markets is through the imposition of compulsory licensing for particular patents or products. This power, which is permitted under TRIPS in special circumstances, has to-date been exercised primarily in pharmaceutical markets in developing economies (Ragavan 2016, Ch. 2). Nevertheless, the possibility of compulsory licensing exists in other industries that have a significant impact on health, safety and welfare of local populations (id; Contreras & McManis 2014). In response to the dominance of the local Indian mobile devices market by foreign patent holders, some have proposed the imposition of a compulsory licensing regime in this market, a proposal that is beyond the scope of this chapter (Lakshané 2015).

D. Increase Patenting By Local Firms

As the competitive advantage possessed by Have firms derives to a large degree from patents on standardized technology, some have suggested that it would benefit local firms to increase their own patenting activity (Ramel & Blind 2015). Increased patenting by local firms would, it is argued, give such firms greater bargaining power in licensing negotiations with existing Have firms. While this conclusion is correct on a theoretical level, it may oversimplify the issue. The acquisition of patents is not itself a productive activity, but a by-product of technological innovation. Thus, unless one seeks to encourage speculative patenting divorced from technical development (a goal that most would agree is undesirable), obtaining patents must be coupled with technological development.[23] To the extent that patents cover technical standards, that technical development usually occurs in connection with participation in an SSO.[24] Thus, to enhance their bargaining position Have-Not firms should seek not to increase their patenting activity, but their participation in international standardization activities (see VI.E below). If they do, their ability to obtain patents covering their technical contributions should follow.

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could block innovation should be considered in a latecomer context as one of the criteria to assess success in standardization" (p. 858).

[22] To some degree, these investigations echo similar investigations by U.S. and European competition law authorities.

[23] This point is underscored by Ernst et al (2014), who argue that "IPR protection can only contribute to economic development if it takes place as part of a multi-faceted innovation strategy that seeks to strengthen absorptive and innovative capabilities of firms, and to develop a broad-based innovation infrastructure (including standards)" (p. 858, citations omitted).

[24] While individual firms often develop technologies internally which they then bring to SSOs for standardization, a significant amount of revision, compromise and development also occurs within the collaborative SSO setting.

It is, of course, a separate question whether local governments should facilitate patenting by domestic providers. Doing so in a manner that discriminates against foreign firms would generally run afoul of TRIPS and other treaty obligations.[25] However, as discussed in the next section, governments can help their domestic industry engage more actively in international standardization efforts by funding additional R&D and SSO participation.

E. Increase SSO Participation by Local Firms

Have-Not firms can realize a range of potential benefits from active participation in international SSOs.[26] First, as observed by Büthe and Mattli (2011, 9, 211-12), firms that embed their proprietary technology into industry standards early during the standardization process can realize significant market gains and strategic advantages. Second, SSO participants can influence the direction of standardized technologies in a manner that favors, or at least takes into consideration, local markets and local technology/patent positions. Involvement in charting the future direction of technology standards can also give firms insight into and advance notice of product development and evolution opportunities. Participation may also give local firms opportunities to export interoperable products beyond the domestic market. It may also afford increased opportunities for patenting in domestic markets and abroad, and can inform foreign firms of the technology and patent assets that local firms have available for licensing.

From a policy standpoint, increased involvement in SSOs would give Have-Not firms opportunities to influence SSO policies and practices, particularly in ways that might facilitate licensing and technology dissemination in developing markets. For example, SSO policies could provide that offering lower royalty rates for deployment of standards-compliant products in developing markets would *not* violate the SSO's requirement of non-discriminatory treatment.[27] Likewise, SSOs could mandate reduced-royalty or royalty-free licensing in certain markets or under certain conditions.

Despite the many potential advantages of international SSO participation, with a few exceptions, Have-Not firms have not yet made meaningful and sustained contributions in these organizations. This absence is rendered the more notable by express policies intended to ensure broad participation in such SSOs. For example, participation in international Category I SSOs such as ISO and ITU is often determined on a national basis.[28] The national delegations to bodies such as these present good opportunities for involvement by firms from less-developed countries. Some Category I SSOs such as ETSI, and most Category II SSOs, such as IEEE, ASTM and IETF are, by their own policies, open to participation by all

[25] These obligations require local patent offices to afford "national treatment" to foreign applicants, treating them on the same basis as local applicants.

[26] Ernst et al (2014) focus on the development of national standardization policies within developing countries that blend elements of the industry-led U.S. approach and more nationalized approaches adopted in China and Korea (p. 861). This approach has much to recommend it. However, the recommendation of this chapter differs from that of Ernst et al (2014) in that it emphasizes the engagement of Have-Not firms in international standardization activities, rather than the development of specific national standardization policies.

[27] Major research universities around the world have adopted a similar stance in a 2007 document entitled "In the Public Interest: Nine Points to Consider in Licensing University Technology". The "Nine Points" document expressly acknowledges that "responsible licensing includes consideration of the needs of people in developing countries and members of other underserved populations".

[28] See Part I, above.

interested organizations. Accordingly, the only barriers to participation in these SSOs, which represent a significant portion of global standardization activity,[29] arise from a lack of technical skill, financial resources and interest among Have-Not firms. These deficiencies are, of course, very real and very serious. However, as discussed below, financial barriers to participation can be overcome, at least in part, through national and philanthropic programs that provide resources for technical training and participation in international SSOs. The example of Chinese firms such as Huawei and ZTE (Contreras 2014), illustrate that it is possible for local firms, with sufficient determination, governmental support and expenditure of resources, to become significant forces in international standardization activities.[30]

F. Incentivizing Increased SSO Participation

1. Trade Agreements

Trade agreements, despite their potential to facilitate the involvement of local firms in international SSOs, have, to date, done little in this regard. Though the TPP includes an entire chapter devoted to standards, its goal is ensuring that locally-developed standards, generally those relating to health and safety, are open and transparent and do not discriminate against foreign producers.[31] The standards focus of the TPP is thus inward looking with respect to less-developed countries, ensuring that they allow international firms to enter without standards-based barriers, rather than outbound, or helping them to participate in the broader global standardization community.

In addition, future trade agreements could encourage greater openness to Have-Not participation in nationally-based SSOs, require that nationally-adopted standards originate from open SSOs, and establish international bodies designed to support Have-Not participation in international SSOs.

2. Capacity Building

More important than trade agreements, however, may be international and local capacity building efforts to support greater international SSO participation by representatives from Have-Not firms. As noted by Ernst et al. (2014), "standardization is a highly knowledge-intensive activity that requires well educated and experienced engineers and other professionals" (p. 855). The training and development of such personnel does not come cheaply and requires significant financial and institutional support (Bremer 2016). For Have-Not firms lacking the internal resources to fund such training and development, such support must come from external sources. These sources could include grants from local governments, non-governmental organizations (NGOs), and multi-governmental organizations (e.g., the World Intellectual Property Organization (WIPO)).

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[29] Because Category 3 SSOs (consortia) are typically formed by small groups of firms with an existing technology and patent position, it is not realistic to hope that they will be fruitful avenues for greater Have-Not firm participation.

[30] Of course, China recently underwent a phase during which it concentrated significant resources on the development of local standards without heavy foreign patent coverage (see Part V.B, above, discussing initiatives such as China's TD-SCDMA 3G mobile telephony effort, as well as Ernst (2011), which details several such efforts). While many would argue that these efforts were ultimately of limited success, it is possible that they did serve the goal of preparing Chinese firms to participate in international standardization efforts.

[31] *See* Trans-Pacific Partnership, Chapter 8 (Technical Barriers to Trade). This is the TBT issue discussed in note 2 above.

SSOs themselves could also offer support to Have-Not firms wishing to participate. Such programs already exist within some SSOs. For example, the Internet Society (ISOC), a US/Switzerland-based NGO that oversees the IETF, a major developer of Internet standards, regularly sponsors a number of Fellows from developing countries to participate in IETF meetings and other activities.[32] The Kolkata chapter of ISOC sponsors an express "Indian IETF Capacity Building Program".[33] Other SSOs sponsor participation by consumer advocates and other community representatives (Bremer 2016). Program such as these can be underwritten by SSO membership dues as well as fees charged for published standards. With such support programs in place, the steep costs of international SSO participation could be defrayed for Have-Not firms, thus broadening overall participation and promoting broader representation in these critical global organizations.

Another component of governmental and institutional support for standardization is educational. Countries such as India already possess world-class educational institutions in the science and engineering disciplines. However, it is not clear that these institutions uniformly emphasize standards education and training. The need for greater education in the area of standards has been noted even within the United States by the National Institute for Standards and Technology (NIST), which has funded efforts at several U.S. universities to promote curriculum and program development relating to standards, and itself offers various training programs relating to standards for U.S. government agencies and the private sector.[34]

Finally, it has been observed that many individuals in developing countries, both in government and the private sector, mistrust international SSOs and transnational bodies in general (Maskus 2012, 166-67). This mistrust may not be entirely unjustified, as there has traditionally been little representation of developing countries at international SSOs, and the needs and views of developing countries are seldom taken into account. Nevertheless, in order to take part more fully in international product development and standardization, these prejudices within developing countries will have to be overcome. Once that happens, assuming that the financial and institution support described above exists, Have-Not firms will be able to engage more meaningfully at international SSOs, which may in turn begin to change attitudes and assumptions about SSOs within the developing world.

G. Applications in India

India's 2016 National Intellectual Property Rights Policy emphasizes the need for capacity building in numerous areas including IP prosecution, enforcement and policy development. It does not, however, address capacity in standardization education or development. Nevertheless, such capacity building remains important in India, as it does in many developing economies.

The support mechanisms described in Part VI.F above may seem superfluous in India, which is already a major market for ICT products and possesses sophisticated governmental and private organizations devoted to standardization. For example, the

[32] http://www.internetsociety.org/what-we-do/education-and-leadership-programmes/ietf-and-ois-programmes/internet-society-fellowship.

[33] http://iicb.org/about.

[34] See www.nist.gov.

Indian government's Bureau of Indian Standards (BIS) conducts standardization activity in fourteen industry sectors including computer communications, networks and interfaces (DIPP 2016). The Telecommunications Engineering Center (TEC) operated by the Ministry of Communications and Information Technology coordinates with international SSOs including ETSI, ITU, IEEE and IETF in developing telecommunications standards (ibid). And private trade associations such as the Telecom Standards Development Society of India (TSDSI), the Global ICT Standardization Forum for India (GISFI), and the Development Organization of Standards for Telecommunications in India (DOSTI) facilitate the development of standards for the Indian ICT sector, often in cooperation with international SSOs (ibid.)

But it may be the very existence of this domestic standardization infrastructure that inhibits greater direct Indian participation in international SSOs. The seemingly sophisticated network of Indian standardization activities may have made the Indian government and industry somewhat complacent about participation in leading international standardization efforts. But these activities are by no means equivalent in importance or impact. While domestic standardization efforts may facilitate the adoption and adaptation of international standards for local Indian needs (admittedly, a necessary function), they appear largely to follow the lead of the dominant international SSOs, rather than participate in this leadership. Participation in domestic standardization activities is thus no substitute for active engagement at the international SSO level. Thus, the Indian government and private standards groups could increase their prominence internationally by supporting (institutionally and financially) greater engagement by Indian firms in international SSOs.[35]

Conclusion

Patents on standardized technologies are being issued with increasing frequency, and the majority of these patents are held by large multinational firms based in developed economies. As a result, firms from less-developed economies with sparse patent holdings are disadvantaged in both domestic and foreign markets. While protectionist governmental policies can address these disparities, such measures are potentially contrary to international treaty obligations and generally unsuccessful in the long term. An alternative approach involves greater participation in international SSOs by firms from less-developed economies. This increased participation is likely to benefit such firms both in terms of technology development, strengthening of patent positions, and influence over SSO policies. To facilitate increased participation, both financial and institutional support will be required from local governments, NGOs, multinational organizations and SSOs themselves. To the extent that participation in international SSOs by firms in developing economies such as India can be increased, it could have a meaningful impact on domestic innovation, job creation, technical capability and manufacturing output.

[35] The author understands that one of the goals of TSDSI is to engage actively in the work of international SSOs. However, the impact of this relatively new organization remains to be seen. Moreover, it appears that the membership of TSDSI may consist largely of the Indian affiliates of foreign technology firms, which may not do much to increase engagement by local firms in international SSOs.

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